

6 August 1982

STAT

MEMORANDUM FOR:   
Architectural Design Staff, LSD/OL/DDA

STAT

FROM:   
Systems Analyst, E&PS/FBIS/DDS&T

SUBJECT: Computer Room AC Requirements

Attached is a copy of specifications for AC requirements for a VAX-11/730. I have circled the type of equipment that will be located in the Computer Room.



STAT

## ROUTING AND RECORD SHEET

SUBJECT: (Optional)

Computer Room AC Requirements

FROM:

Systems Analysts, EGPS/FBIS/DDS&T  
401 Key Building

EXTENSION

NO.

DATE

6 August 1982

TO: (Officer designation, room number, and building)

DATE

RECEIVED

FORWARDED

OFFICER'S  
INITIALS

COMMENTS (Number each comment to show from whom to whom. Draw a line across column after each comment.)

1. Architectural Design Staff  
LSD/OL/DDA  
3E14 Headquarters

10 AUG 82 10 AUG 82

JL

VERN:

HERE ARE THE SPECIFICATIONS FOR  
YOUR INPUT FOR ROOM 414 & 415  
KEY BLDG. ARCHITECTURAL DRAWINGS  
WERE COMPLETED AND SENT TO  
SM & FB FOR DISTRIBUTION TO GSA.

John

2. Attn: [redacted]

C/FEB/RECD

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DC

CY

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PL

C

PE

3

11 AUG 1982

10/6/82

sent [redacted] my design  
for A/C, but [redacted]  
claims that it has already  
been requested in a previous  
work request to GSA

### VAX-11/730 Packaged Systems

The VAX-11/730 is available in two packaged system configurations as described in the VAX Systems and Options Summary. The packaged systems are provided to operate with 120Vac, 60Hz or 240Vac, 50Hz input power. Each system contains the VAX-11/730 CPU, a mass storage system mounted in the CPU systems cabinet, and a console terminal. The systems also includes the VAX/VMS operating system software. Several optional cabinets are available with the packaged systems to enable the expansion of the system capabilities. The letter M used in describing the byte capacity of the storage devices is equal to  $1024^2$ .

#### System Code

SV-CXMMMA-CA(CK)

SV-CXMMMA-CD(CN)

#### Power

120Vac, 60Hz

240Vac, 50Hz

This system includes the VAX-11/730 CPU with one Mbyte of ECC MOS main memory, two RL02 disk drive assemblies mounted in the system cabinet with the CPU and an LA120 printer/console. Each RL02 is capable of storing 10 Mbytes of data. The following units are supplied with the system.

- 1- VAX-11/730 CPU System Cabinet with two RL02 Disk Drive assemblies
- 1- LA120 DECwriter III Console Terminal

#### System Code

SV-CXWMA-CA(CK)

SV-CXMMMA-CD(CN)

#### Power

120Vac, 60Hz

240Vac, 50Hz

This system includes the VAX-11/730 CPU with one Mbyte of ECC MOS main memory, one RL02 disk drive assembly, and one R80 disk drive assembly mounted in the system cabinet and one LA120 printer/console terminal. The RL02 disk is capable of storing 10 Mbytes of data and the R80 can store up to 121 Mbytes of data. The following units are supplied with the system.

- 1- VAX-11/730 CPU System Cabinet with one RL02 Disk Drive assembly and one R80 Disk Drive assembly.
- 1- LA120 DECwriter III Console Terminal

### VAX-11/750 Packaged Systems

The VAX-11/750 is available in six packaged system configurations as described in the VAX Systems and Options Summary. The packaged systems operate with 120Vac, 60Hz or 240Vac, 50Hz input power. Each packaged system contains the VAX-11/750 CPU, a mass storage subsystem and a console terminal. The systems include the VAX/VMS Operating System software. The letter M used in describing the byte capacity of the storage devices is equal to  $1024^2$ .

#### System Code

SV-BXDBA-CA(CK)

SV-BXDBA-CD(CN)

#### Power

120Vac, 60Hz

240Vac, 50Hz

This system includes the VAX-11/750 CPU with three Mbytes of ECC MOS main memory, an RGM05 disk drive unit capable of storing 256 Mbytes of data, a TGU77 nine-track magnetic tape storage unit and an LA120 printer/console terminal. The following units are supplied with the systems.

- 1- VAX-11/750 CPU System Cabinet
- 1- RGM05 Disk Drive Unit (includes the RM05 disk drive unit and an RH750 adapter)
- 1- TGU77 Magnetic Tape Unit (includes the TU77 magnetic tape unit and an RH750 adapter)
- 1- LA120 DECwriter III Console Terminal

Digital Field Service representatives. It is recommended that users review their site plans with the field service personnel before construction or modifications to the site are initiated.

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### Delivery Constraints

The route the equipment is to travel from the receiving area to the installation site should be evaluated to ensure problem-free delivery of equipment. Among the factors to be considered are the height and location of the loading doors, the size, capacity, and availability of elevators, the number and size of the aisles and doors. Passageway restrictions, such as bends, slopes and obstructions should also be evaluated. The door to the computer area should be a minimum of 91cm (3 ft.) wide and 213cm (7 ft.) high, and without saddles and sills, to facilitate movement of dollies.

### SYSTEM ENVIRONMENT

The VAX systems and peripheral devices should be operated in a contaminant-free environment that is controlled by an air-conditioning system and provides temperature-controlled, filtered air at the specified levels of humidity. An increase of air pressure in the computer room can prevent the infiltration of dust and other contaminants from adjacent areas if they exist.

The VAX systems and options are designed and tested for operation according to the Digital Environmental Standards Class A, B and C. These standards are defined as follows:

#### Digital Class A Standard

Temperature	15° to 32°C (59° to 90°F)
Relative Humidity	20 to 80% (no condensation)
Maximum Wet Bulb Temperature	25°C (77°F)
Minimum Dew Point Temperature	2°C (36°F)
Altitude (operating)	Sea Level to 2.4 km (8000 ft)

#### Digital Class B Standard

Temperature	10° to 40°C (50° to 104°F)
Relative Humidity	10 to 90% (no condensation)
Maximum Wet Bulb Temperature	28°C (82°F)
Minimum Dew Point Temperature	2°C (36°F)
Altitude (operating)	Sea level to 2.4 km (8000 ft)

#### Digital Class C Standard

Temperature	5° to 50°C (41° to 122°F)
Relative Humidity	10 to 95% (no condensation)
Maximum Wet Bulb Temperature	32°C (90°F)
Minimum Dew Point Temperature	2°C (36°F)
Altitude (operating)	Sea level to 2.4 km (8000 ft)

The maximum environmental specifications for equipment shipment is as follows.

Temperature	-40° to 66°C (-40° to 151°F)
Relative Humidity	0 to 95% (no condensation)
Altitude	Sea level to 9 km (30,000 ft)

Temperature cycling and thermal gradients can induce changes in materials which will affect the performance of the system. High temperatures also increase the rate of deterioration of materials. An environment of high absolute humidity can cause dimensional changes in lineprinter papers and cards. Low humidity can produce static electricity, resulting in dust accumulation on magnetic tape and disk devices, which will adversely affect the system operation.

Table 1 lists the Digital Environmental Standard information for the equipment included with the VAX systems. The temperature and humidity ranges for each class are defined in the previous paragraph SYSTEM ENVIRONMENT. Some of these classes are modified for specific equipments. Table 2 lists the similar environmental information for the peripheral devices associated with the VAX systems.

This information represents the maximum ranges at which the equipments were designed and tested and do not represent the recommended operating temperature range. For maximum system reliability the following site specifications are recommended. The recommended system shut-down temperature is 30°C(85°F).

Operating temperature	21°C ± 3°C (70°F ± 5°F)
Temperature rate of change	3°C/h (5.5°F/h)
Relative Humidity	50% ± 10% (no condensation)
Humidity rate of change	6%/h

**Table 1 VAX Equipment, Environmental Standards**

Unit	Digital Environmental Standard
VAX-11/730 System Cabinet with 2-RL02 disk drives	Class B
VAX-11/730 System Cabinet with 1-RL02 disk drive and 1-R80 disk drive	Class B (modified) Relative Humidity: operating 10% to 85%
VAX-11/730 Expansion Cabinet with 2-RL02 disk drives	Class B
VAX-11/730 Expansion Cabinet with BA11-KW Box	Class B
VAX-11/750 CPU Cabinet	Class B
VAX-11/750 CPU Expansion Cabinet with BA11-KW Box	Class B
VAX-11/780 CPU Cabinet	Class A
VAX-11/780 CPU Expansion Cabinet, H9602-HA(HB)	Class A
VAX-11/780 UNIBUS Options Cabinet, H9602-MF(MH)	Class A
MA780 Multiport Memory Cabinet, H9602-HA(HB)	Class A
VAX-11/782 Packaged Systems	Class A
VAX-11/782 Upgrade Package	Class A

Device	Digital Environmental Standards
CME11 Card Reader Unit	Class A
CR11 Card Reader Unit	Class A
CR11-B Card Reader Unit	Class A
1 / <u>LP11-A, -B (LP25)</u> Lineprinter Unit	Class B
LP11-C, -D (LP14) Lineprinter Unit	Class B
LP11-Y, -Z (LP06) Lineprinter Unit	Class A (modified) Operating: temperature 10°C to 32°C (50°F to 90°F) relative humidity 30% to 90% (no condensation) Storage: temperature -18°C to 66°C (0°F to 151°F) relative humidity 5% to 95%
LA34 DECwriter IV, Printer Terminal	Class B
LA38 DECwriter IV, Printer Terminal	Class B
1 / <u>LA120 DECwriter III, Printer Terminal</u>	Class B
LA100 Printer	Class B
LXY11, LXY21 (LXY01, LXY02) Print- er/Plotter Unit	Class B (modified) Relative Humidity: operating 30% to 90% storage 5% to 95%
RL02 Disk Drive Unit RK07 Disk Drive Unit	Class B Class B (modified) Relative Humidity: operating 8% to 80% (no condensation) storage 8% to 80%
RM03 Disk Drive Unit	Class A
RM05 Disk Drive Unit and Utility Cabinet	Class A
2 / <u>R80 and RM80 Disk Drive Unit</u>	Class B (modified) Relative Humidity: operating 10% to 85% (no condensation) storage 10% to 85%

Device	Digital Environmental Standards
RP06 Disk Drive Unit	Class A
RP07 Disk Drive Unit	Class A
TE16 Magnetic Tape Unit	Class A
TS11 Magnetic Tape Unit	Class A
TU77 Magnetic Tape Unit	Class A
TU78 Magnetic Tape Unit	Class A
VT100 Series Video Terminal	Class B

### Lighting

When video displays using Cathode Ray Tubes (CRT's) are included with a system, a reduced lighting level at the site will prevent excessive reflection from the face of the CRT and enable the display to be more easily viewed. The light level may be controlled by dimmers, however these devices are frequently the cause of electrical noise. Dimmers should not be installed in the lighting power feed that is used for the computer systems and the dimmers should be selected for low interference characteristics.

Screen filters for the video terminals' CRTs are also available to reduce the glare of the overhead lighting and improve the contrast of the characters on the display.

In addition, the type of lighting fixture used and the fixture location should be considered when planning the location of the CRT devices. Exposing the computer area to direct sunlight should be avoided.

The following light intensities, measured at 76cm (30 in.) above the floor, are recommended.

CRT device areas — 430 lumens/m<sup>2</sup> (40 footcandles)

other computer areas — 650 lumens/m<sup>2</sup> (60 footcandles)

### Accoustical Treatment

Some peripheral devices such as lineprinters, character printers, disk drives, magnetic tape units, and card readers, generate noise when operating. Noise is also produced by the fans used to dissipate the heat generated by the power supplies and electronic components in a system.

Several methods are available for reducing the noise levels at the computer site. The devices generating the noise may be isolated or sound absorbing materials can be used.

Sound absorbant ceiling tile is recommended and the walls may be covered with fire resistant fabric such as drapes or other suitable materials which will reduce reflected noise. Anti-static floor carpeting may be installed if necessary however anti-static floor tile is recommended.

Also available are padded room dividers which may be installed between the noise source and other office areas.

### Shock and Vibrations

The VAX systems equipment is designed to withstand the normal shocks and vibrations that occur during shipment and during their normal operation in office area and computer rooms.

When the units are to be installed at locations which present excessive shock and vibrations contact your local DIGITAL sales office or field service representative for a site evaluation.

### Static Electricity

A VAX system and its related cabinets should be adequately grounded to prevent the effects of static electricity from interfering with the equipment operation. The static charges generated can also be reduced by ensuring that the relative humidity of the room is maintained above 30 percent. When raised floors are used at the computer installation, the metal framing of the floor

**Table 4 VAX-11/730 Cabinets and Options, Power and Thermal Specifications**

<b>Cabinets and Options</b>	<b>ac Power Requirements (watts)</b>	<b>Thermal Dissipation (Btu/h)</b>
CPU System Cabinet with two RL02 disk drives	790	2693
CPU System Cabinet with one RL02 and one R80 disk drive	1205	4109
H9642 expansion cabinet with two RL02 disk drives	320	1092
H9642 expansion cabinet with a BA11-KW mounting box	1224(max)	4173
Four Mbytes of ECC MOS memory (four-MS730-CA modules)	50	170
TS11 magnetic tape controller module	25	85
FP730 Floating-Point Accelerator module	50.5	172
DMF32-AB Communications Option	55	188

**VAX-11/750 Packaged System Power**

Table 5 lists the average ac power requirements for the VAX-11/750 packaged systems. These systems include the cabinets and terminals as defined in the VAX-11/750 System Descriptions contained in the INTRODUCTION to this guide. Table 6 lists the average ac power requirements of the CPU System cabinet, the expansion cabinet, and the options that can be installed into the system.

**Table 5 VAX-11/750 Packaged Systems, Power and Thermal Specifications**

<b>System Code</b>	<b>ac Power Requirements (watts)</b>	<b>Thermal Dissipation (Btu/h)</b>
SV-BXDBA-CA(CD)	6152	21,000
SV-BXHHA-AA(AD)	3615	12,290
SV-BXTAA-AA(AD)	4390	14,926
SV-BXWAA-AA(AD)	3980	13,612
SV-BXWBA-CA(CD)	5080	17,349
SV-BXWVA-CA(CD)	3755	12,826



Table 9 lists the average ac power requirements for the VAX-11/782 packaged systems and upgrade package. These systems include the cabinets and terminals defined in the VAX-11/782 Systems Descriptions contained in the INTRODUCTION to this guide. Where cabinets, terminals and options are included with these systems, refer to Table 8 for the ac power requirements of the additional units or options.

**Table 9 VAX-11/782 Packaged Systems, Power and Thermal Specifications**

System Code	ac Power Requirements (watts)	Thermal Dissipation (Btu/h)
SV-AADCA-CA(CD)	22,600	71,642
SV-AAVCA-CA(CD)	21,939	69,547
SV-AAWCA-CA(CD)	20,528	65,074
11/782-AA(AB)	7640	26,052

**Peripheral Devices, ac Power**

Table 10 lists the average ac power (in watts) required by the peripheral devices associated with the VAX systems.

**Table 10 Peripheral Devices, Power and Thermal Specifications**

Terminal/Device	AC Power Requirements (watts)	Thermal Dissipation (Btu/h)
CME11 Card Reader	185	630
CR11, CR11-A Card Reader	600	2046
CR11-B Card Reader	700	2387
LA34 DECwriter IV	45	154
LA38 DECwriter IV	45	154
LA100 Printer	138	471
LA120 DECwriter III	440	1500
LP11-A, -B Lineprinter	350	1194
LP11-C, -D Lineprinter	825	2833
LP11-Y, -Z Lineprinter	680	2312
LXY11, LXY21 Printer/Plotter	450	1539

Table 10 Peripheral Devices, Power and Thermal Specifications (cont)

Terminal/Device	AC Power Requirements (watts)	Thermal Dissipation (Btu/h)
RK07 Disk Drive 120V(60Hz)	396	1351
RK07 Disk Drive 240V(50Hz)	400	1501
RL02 Disk Drive	160	546
RM03 Disk Drive	1050	3583
RM05 Disk Drive	1460	4978
RM05 Utility Cabinet	252	859
2 RM80 Disk Drive	640	2185 + 2185
RP06 Disk Drive	1285	4385
RP07 Disk Drive	2051	7000
TE16 Magnetic Tape (master)	975	3327
TE16 Magnetic Tape (slave)	724	2471
1 TS11 Magnetic Tape	1200	4096
TU77 Magnetic Tape (master)	2300	7850
TU77 Magnetic Tape (slave)	2000	6826
TU78 Magnetic Tape (master)	1960	6689
TU78 Magnetic Tape (slave)	1500	5120
1 VT100 Series Video Terminals	150	512

# HEATLOAD FROM VAX 11/730

	<u>Load (B/hr)</u>	<u>watts</u>
CPU	2693	790
memory	170	50
type controller	85	25
communication	188	55
Printer	1500	440
Lineprinter	1194	350
Disk Drive	2185	640
	2185	640
Magnetic Tape	4096	1200
Terminals	512	<u>150</u>
<u>Total</u>	<u>14,808 B/hr</u>	<u>4340 watts</u>

14,808 B/hr  $\Rightarrow$  1.23 tons

using 208 volt  $\Rightarrow$  21 amps total

McCaug Thinline TSC-081E  
type A coil

air { inlet 74°F 800 cfm  
with 61°F w.b.

total 21,500 B/h  
sensible 16,300 B/h

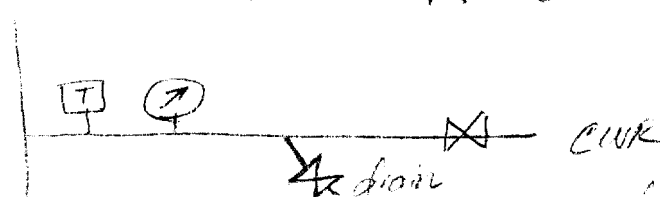
gpm = 4.5  
Δp = 10.4 (ft H<sub>2</sub>O)

chilled water { inlet temp 46°F  
gpm 5.4  
Δp (ft H<sub>2</sub>O) 14.2  
exit temp 53°F

DMR Associates, Inc.  
16830 Oakmont Ave.  
Beverly Hills, CA 90216  
341-948-0020

flow control valve gauge

fan coil  
unit



condensate